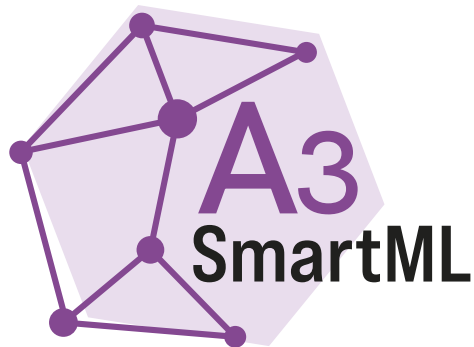




Newsletter

January 2026

A3SmartML (Automated, Adaptive and Uncertainty-aware Smart Measurements using Machine Learning) is a European research project within the European Partnership on Metrology programme co-financed from the European Union's Horizon Europe Research and Innovation Programme and by the Participating States. The project has 14 participants consisting of six National Metrology Institutes, three universities, one national synchrotron facility and four companies. The project is coordinated by Physikalisch-Technische Bundesanstalt (PTB).

About A3SmartML

Smart measurements are key enabling technologies to achieve and realise European strategic policies devoted to sustainability and digitalisation within the framework of Industry 4.0 and European Green Deal. These smart multidimensional measurements are often challenged by long acquisition times or limited resolution. This project will develop methods to significantly improve the efficiency of such measurements. The development will combine tools from machine learning, compressed sensing, regularisation, and Bayesian statistics. Several metrological case studies will be treated to demonstrate immediate impact. To further facilitate the uptake of the developed procedures, extensive guidance documents, documented software and reference datasets will be provided. Long-term impact will be generated through generic, automated, and adaptive measurement plans applicable to a wide range of multidimensional measurement tasks. This is expected to support the manufacturing industry (e.g. semiconductors) with better quality control leading to reduced costs, zero-waste and sustainable manufacturing targets.

EUROPEAN
PARTNERSHIPCo-funded by
the European UnionMETROLOGY
PARTNERSHIP

Our objectives

The overall objective of the project is to develop novel and generalising approaches for smart multidimensional measurements with significantly reduced experimental effort and validated uncertainty evaluation.

The specific objectives that translate to our Work Packages (WPs) of the project are:

1. To develop automated machine learning approaches for the solution of general linear inverse problems based on digitised measurements, arising in scanning hyperspectral imaging or photocurrent mapping of semiconductors. To go beyond the state of the art by basing and extending these approaches with techniques from compressed sensing, low-rank reconstruction, and deep learning. To also train machine learning models to represent prior knowledge and statistically regularise the inverse problem, using both real and synthetic data.
2. To develop uncertainty evaluation methods for the approaches in objective 1 and create generalised tools to metrologically validate the uncertainty evaluation. These tools would include statistical uncertainty assessments and calibration analysis, as well as have the capacity to validate the robustness and reliability of the machine learning model.
3. To develop automated and adaptive measurement strategies for the methods developed in objectives 1 and 2. To achieve a targeted measurement uncertainty while satisfying the constraints of specific metrology applications, such as scanning hyperspectral imaging or photocurrent mapping of semiconductors. To also define a digitised measurement framework to include data management strategies and appropriate automated feedback procedures.
4. To implement the approaches developed in objectives 1 to 3, for metrological applications, such as scanning hyperspectral imaging and photocurrent mapping of semiconductors. To design automated and adaptive measurement strategies by taking into consideration any physical constraints imposed by measurement instruments or methodologies of the applications and develop experimental prototypes.
5. To facilitate the take up of the technology and measurement infrastructure developed in the project by standards developing organisations and end users (semiconductor industry, medical imaging etc.) and to disseminate good practice guidelines and a public database for reference data to all relevant stakeholders.

Kick-Off Meeting in Salerno

With the kick-off meeting on 3rd and 4th June 2025 at the University of Salerno, the work on the research project “Automated, Adaptive and Uncertainty-Aware Smart Measurements using Machine Learning” (A3SmartML), which started in May and is planned for a period of three years, has officially begun.



Figure 1: The kick-off of the project A3SmartML was held on 3rd and 4th June 2025 at the University of Salerno

The University of Salerno is ideally linked to the oldest academic institution in the Old Continent: the Schola Medica Salernitana. Founded in the eighth century AD, the School reached its peak between the 10th and 13th century. The measurement group has strong expertise on the MEMS characterization, uncertainty evaluation, neural network, machine learning and uncertainty assessment in Artificial Neural Networks. In the project UNISA will contribute to WP1, WP2 and WP5.

After an introduction of the participants, the consortium discussed the work planned for the duration of the project. This included the discussion of the challenges and objectives of the project, the work program and the use cases and metrological applications considered within the project. Moreover, the organisation and communication of project-related matters and the distribution of first tasks within the project was discussed. There were 17 persons attending the meeting on-site and 16 persons attending the meeting online. The whole consortium would like to thank the University of Salerno for the organisation of the kick-off meeting and their hospitality.

M9 Project Meeting at CMI in Brno, Czech Republic

On 19th and 20th January 2026, the M9 Project Meeting took place in Brno, Czech Republic, hosted by CMI. CMI is a national metrology institute of the Czech Republic. Department of Nanometrology has experience with SPM

methods for more than 20 years and is active in all its aspects from instrumentation up to data processing. In the project, CMI leads WP3.

The aim of the meeting was to discuss the progress in WP1-4, challenges that have been arising in the first months of the project, and the measures for impact and dissemination that have been initiated or are planned. For WP1-4, the generated data and first progress in the development of the methods for estimation procedures, uncertainty evaluation, smart scanning and the different use cases were presented. Moreover, the first dissemination actions, such as setting up a website and a SharePoint and the first conferences, were presented. Further points, such as the ongoing development within the project and impact actions as definition of the stakeholder committee were discussed. Further information regarding the development of the methods and the stakeholder committee will be shared in the next newsletter. We kindly thank CMI for hosting the meeting!

Challenges to be addressed within the Project A3SmartML

Material characterisation up to the nanoscale and highly resolved defect identification are important elements of modern material science, advanced manufacturing and efficient quality control. Enhancing techniques that perform these complex, multidimensional measurement tasks, such as scanning hyperspectral imaging and photocurrent mapping of semiconductors, through smart measurement strategies supports the EU to realise its strategic policies devoted to sustainability and digitalisation within the framework of Industry 4.0 and the European Green Deal. The optimisation of measurement procedures also aligns with the UN sustainable development goals, the Net Zero Industry Act, and the 2050 long-term strategy of the EU to become the world's first climate-neutral continent. Smart measurements are hereby essential to strengthen Europe's competitiveness in green energy technologies, e.g. by advancing the development of photovoltaic devices through more efficient quality control and defect detection in semiconductors. Simultaneously, the development of smart measurement techniques that will reduce measurement times and enhance data quality in hyperspectral imaging are crucially needed for fundamental research in condensed matter physics, biology, and applied research, such as battery materials and medical devices. These developments also address the time constraints in large-scale user facilities, to optimally use the experimental time at the overbooked beamline to allow for more user experiments, and in the quality control of production lines, accelerating Europe's innovation in material science and aiding the development of new products in industrial areas like telecommunication and renewable energy.

The time- and quality-related constraints lead to a mathematical problem, i.e., a linear inverse problem, which solution aims for an optimized and time-efficient measurement strategy. To solve this problem, the utilization of ML methods will be focused within this project. However, AI-based methods often lack in interpretability and trustworthiness, especially in comparison to "classical" metrological approaches. The classical approaches, on the other hand, do not necessarily fulfil the requirements regarding time-efficiency and the solution of the inverse problem. Therefore, a combination of modern AI-based methods with established metrological concepts that ensure for a time-efficient but trustworthy measurement result including a validated quantification of the uncertainty is needed.

Use Cases: Metrological Applications considered in the Project

The practical demonstration of the methodologies developed in this project is a necessity. To improve the long-term measurement capabilities of the NMIs and DIs involved, experimental prototypes are needed. Moreover, these prototypes also address the needs and time constraints in large-scale user facilities, such as synchrotrons and storage rings, or in the quality control of production lines, aiding the development of new products for telecommunication, renewable energy and medical imaging.

Throughout the project, two applications are used to ensure the applicability of the developed methods to practical use cases. Those two applications used for continuous testing and adjustment of the automated, adaptive and uncertainty-aware methods for smart measurements that are developed throughout the project are:

- Scanning hyperspectral imaging
- Photocurrent mapping

Beyond the two applications considered throughout the project, further areas of metrology have the need for smart measurement approaches. Therefore, the following use-cases are additionally addressed in WP4:

- Hyperspectral imaging scatterometry
- Laser induced breakdown spectroscopy
- Laser intensity modulation method
- X-ray scattering Computed Tomography

In the following, the six metrological applications are described in more detail.

Scanning hyperspectral imaging

Scanning hyperspectral imaging (SHSI) is widely applied in industry, e.g. to characterise and spatially resolve chemical components of organic and inorganic material, or to identify material defects in semiconductors. Variants like scattering-type Scanning Near-Field Optical Microscopy (s-SNOM) are prominently used for nano-spectroscopy and present in many user facilities like infrared (IR) beamlines and synchrotrons in the EU and world-wide. Due to the sequential nature of the scanning-based measurements, there is a need to reduce measurement times that commonly take hours to a day. The implementation of smart measurement techniques is required for working with sensitive samples that tend to drift or degrade during long measurement sessions, ensuring that high-quality data can still be obtained without compromising the sample's integrity. Moreover, faster data acquisition is needed to monitor devices that change over time, such as real-time growth of layers, offering unprecedented insights into dynamic processes.

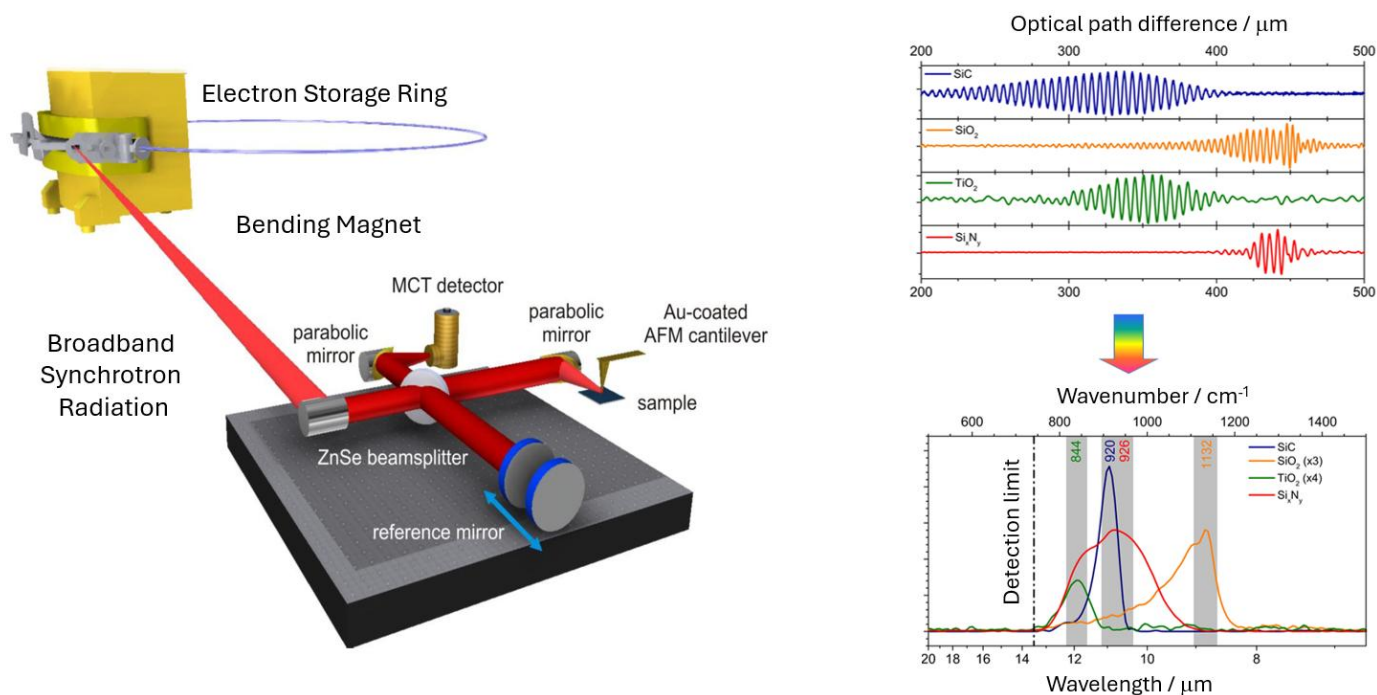


Figure 2: Visualisation of the sHSI system (left) with the radiation from a storage ring passing through an interferometer and directed onto an atomic force microscopy tip. The interferogram (illustrated on the right) is specific for different materials. Here, subsampling strategies for improving the measurement result are applied, and subsequently Fourier transformed to obtain the nanoscale resolved spectrum.

The sHSI use case is provided by PTB.

Photocurrent mapping

Achieving megapixel resolution for photocurrent mapping (PCM) enables the quantification of fine spatial variations in the photocurrent across semiconductor materials, which is needed to identify defects, impurities or irregularities at different length scales. This is needed since a small number of microscopic defects can impact the performance and lifetime of large-area devices such as solar cells. Also, manufacturing industry in areas such as telecommunication, automotive, renewable energy and medical instruments employ semiconductors and need reliable materials with a long lifecycle to reduce waste and act sustainably.

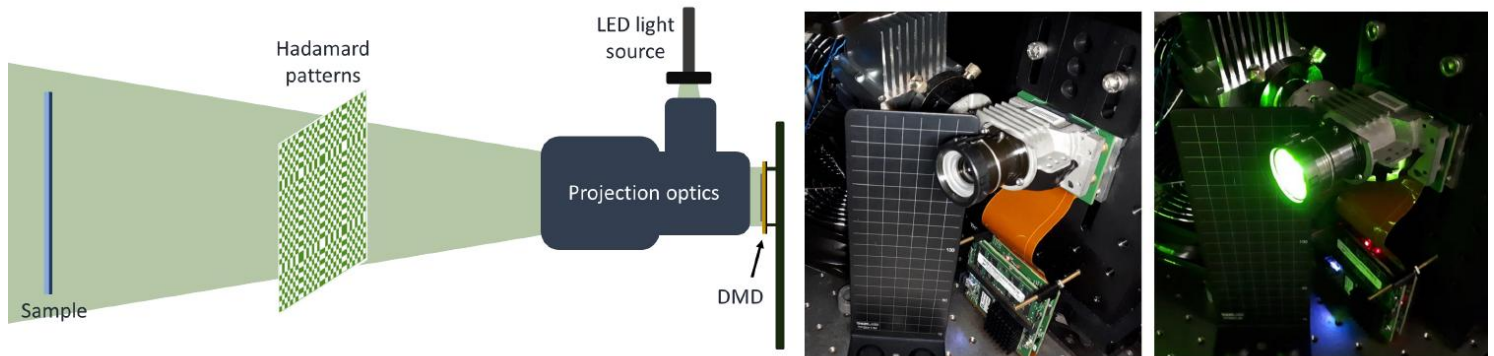


Figure 3: Visualisation of the PCM system

The PCM use case is provided by NPL.

Hyperspectral imaging scatterometry

Hyperspectral imaging scatterometry (HIS) is a novel technique to be used in the photonics industry for the fast large area characterization of form deviations of diffractive optical elements that are manufactured for Augmented Reality (AR) see-through glasses. Scatterometry allows for measurement of parameters that are difficult to measure using alternative techniques, such as atomic force microscopy. From a single measurement it is possible to acquire parameters such as grating period and step height. Combining hyperspectral imaging with scatterometry, the sample can be imaged with higher resolution than with a traditional scatterometer. This allows for detection of small defects and inhomogeneities in diffractive optical elements, enabling more accurate quality control of the manufacturing process. For the quality control and manufacturing of these large area optical elements, an improved metrology, using smart measurement techniques powered with AI analysis that enable faster measurement times and enhanced data accuracy, is needed to make production more economical with higher yield.

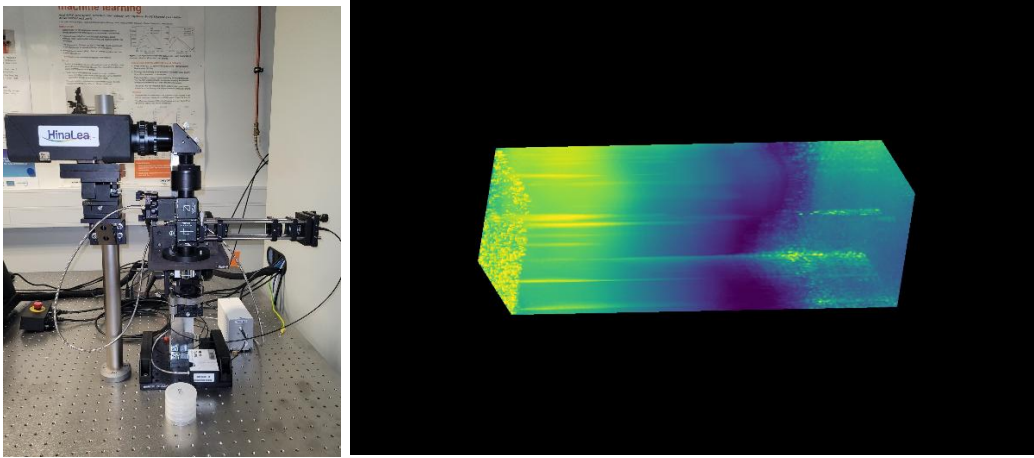
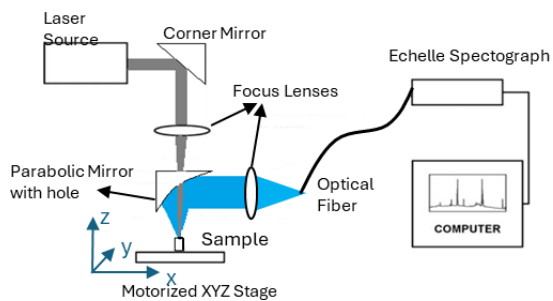


Figure 4: Visualisation of the HIS system and resulting data cube.

The HIS use case is provided by VTT.

Laser induced breakdown spectroscopy

Laser induced breakdown spectroscopy (LIBS) is a powerful analytical technique that is commonly employed for rapid and non-contact analysis, e.g. of metals and alloys in foundries and manufacturing plants. Due to the possibility to apply LIBS concurrently with production, smart measurement procedures to reduce measurement times and to perform reliable uncertainty evaluation are required and the incorporation of ML tools is widely supported



NIST LIBS Database ?

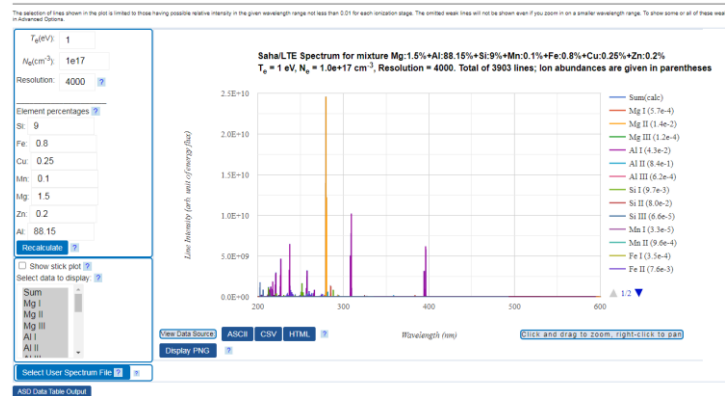


Figure 5: Visualisation of the LIBS system and synthetic data graphs for Aluminum Alloy which is used as reference material

The LIBS use case is provided by TUBITAK UME.

Laser intensity modulation method

For the laser intensity modulation method (LIMM), an intensity modulated laser is used as a thermal probe to investigate the functional activity of a piezoelectric sample. By measuring the sample current as a function of laser modulation frequency, a full 3D map of material performance can be determined. Piezoelectric materials are applied in optical high-speed communication and data transmission applications, as well as for remote sensing, acoustic/sonar ultrasound imaging, ferroelectric memories and other sensors/actuators and transducers. There is a pressing need to quantify the piezoelectric or pyroelectric response of these materials both spatially, across their surface, and additionally through their thickness, as performance is compromised through many machining and manufacturing processes. To identify such large-scale defects and flaws, a quantitative assessment of the functional performance from the full 3D volume of material is required. LIMM metrology has been developed to explore through thickness performance but the speed by which the method can map out a real sample's surface, let alone through its thickness, drastically limits its commercial application. Therefore, fast and reliable estimation and uncertainty evaluation procedures for these typically sparse or often slowly varying datasets are needed to improve the metrology underpinning the LIMM method. The development of smart measurements techniques, with the goals of reducing measurement times and improving data quality, is of particular value to companies who rely on high-quality materials and good characterisation of the material properties.

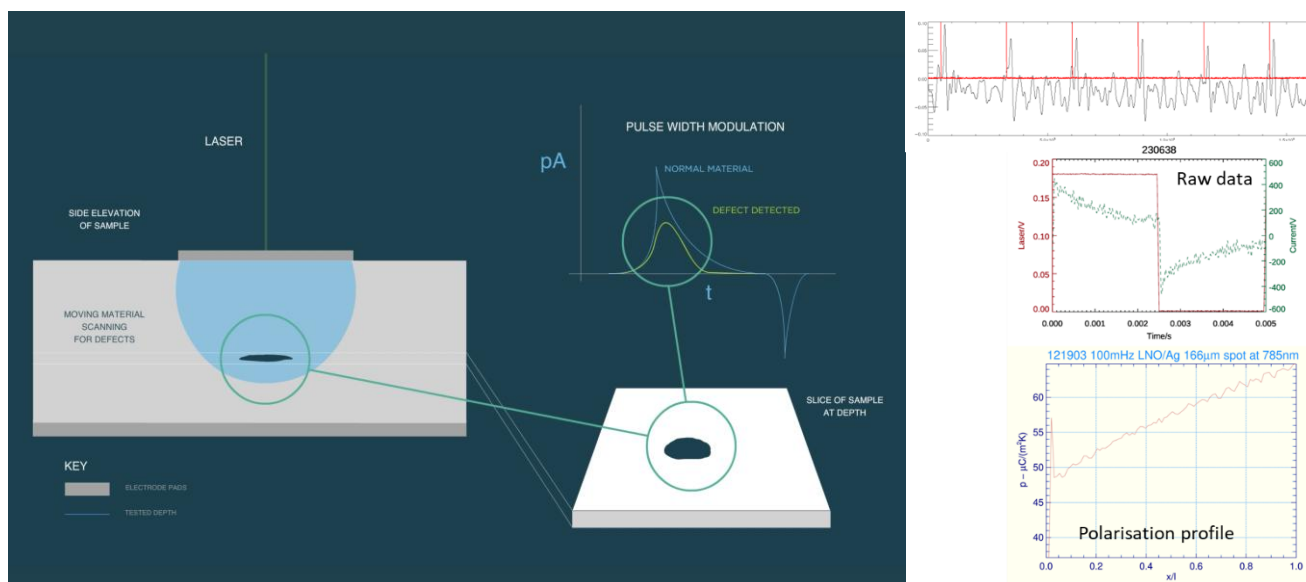


Figure 6: Visualisation of the LIMM system, measurement data and polarisation profile

The LIMM Use Case is provided by Electro and CMI.

X-ray Scatter-based Computed Tomography

X-ray scatter-based computed tomography such as X-ray diffraction computed tomography (XRD-CT) and pair distribution function computed tomography (PDF-CT) are being applied across academic and industrial fields including pharmaceutical, chemicals battery storage and energy materials. These methods are extremely powerful as they allow chemistry, generally non-destructively, to be imaged inside objects under static and indeed working conditions. This can be used for instance to resolve and understand deactivation and aging processes in devices, enabling them to be improved to offer better performance or longevity. The example in the figure 7 below shows

its application to look at the chemical phase distributions inside batteries. In this particular study, XRD-CT was used to reveal heterogeneities arising through charge-discharge cycling rate; this kind of study enables battery producers to improve lifetime of their battery products. This is just one example, but XRD-CT has been used to improve other systems such as emission control units in catalytic converters.

Whilst extremely powerful and providing much greater insight than convention CT, these techniques currently typically employ slow scanning approaches. Single slices of large objects with high spatial resolution can take many minutes to hours to acquire. Smart measurement strategies are required to reduce measurement time and associated costs. Reduced measurement time has the added benefit of reduced radiation exposure which is relevant to some samples / material systems. Furthermore, smart tomographic reconstruction approaches are required to maximise the physico-chemical insight gained especially when data quality is poor. The latter is particularly pertinent as simple approach to reducing measurement time is to collect more quickly and skip entirely some measurements and new approaches to reconstruction of low-quality sparse data are required. This is a common ambition and challenge for computed tomography in general and one that the A3SmartML project aims to meet and demonstrate, with a variety of tomography modalities including application to scatter based tomography.

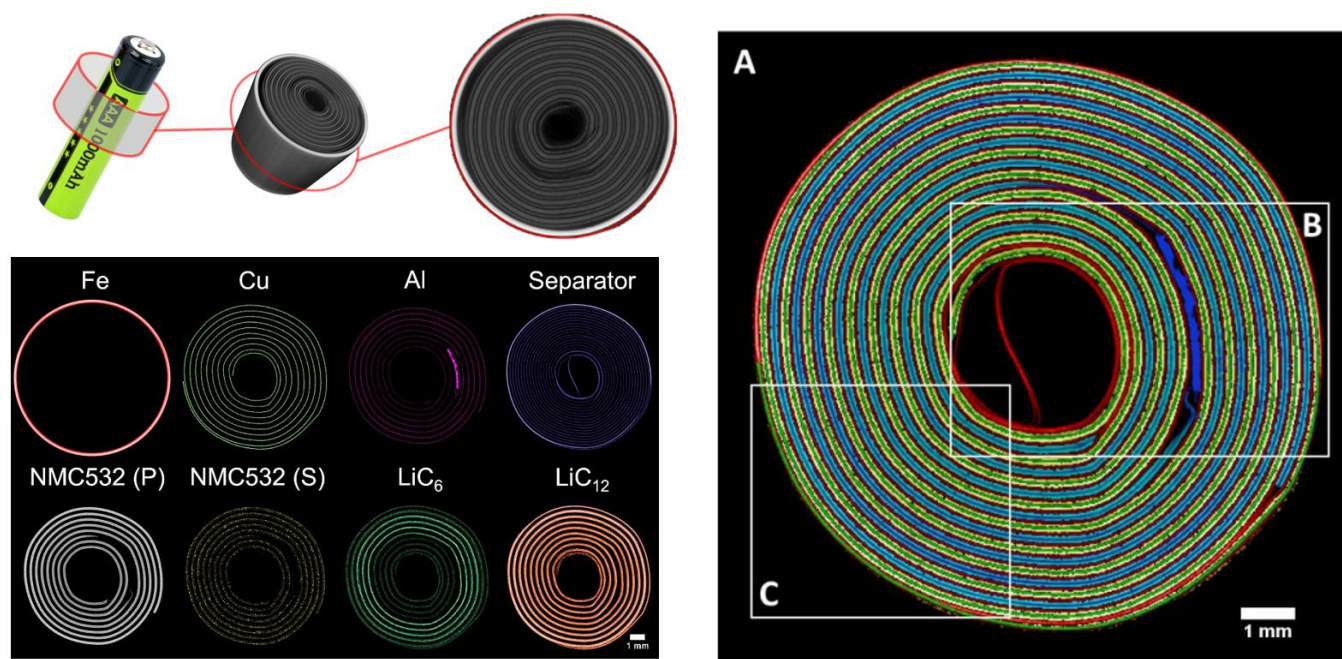


Figure 7 Scatter-based methods such as XRD-CT allowing, non-destructively, mapping of chemistry and other physico-chemical information. Shown here in lower left pane is the distribution of different chemical species in a single slice through a lithium ion battery. Such images can be obtained under in situ operando conditions. Right, Overlaid image of cell components identified in the AAA pristine battery cell: Red - separator, Yellow - anode (LiC₁₂), Green - Cu current collector, Cyan - cathode (primary NMC532), Dark Blue - Al current collector. After Vamvakeros et al. *Small Methods*, DOI: 10.1002/smt.202100512

The X-ray scatter-based computed tomography use case is provided by Finden.

Publications and conference presentations

In the first 6 months, A3SmartML has been presented at two conferences:

Mathmet 2025 Conference, Gothenburg, Sweden

Marschall, M. (2025, October): Automated, Adaptive and Uncertainty-Aware Smart Measurements using Machine Learning [Poster Presentation]. Mathmet 2025 Conference, Gothenburg, Sweden.

From 7th until 9th of October 2025, the Mathmet 2025 Conference, organised by the Research Institutes of Sweden (RISE) and Chalmers University of Technology, was held in Gothenburg, Sweden. Mathmet 2025 is an event of the European Metrology Network (EMN) for Mathematics and Statistics to promote new analytical and computational approaches in measurement science. At this conference, the A3SmartML project was presented as a poster presentation prepared and given by Manuel Marschall (PTB).

Mathmet 2025, preliminary programme Wednesday 8 October	
Introduction (RunAn) Chair Nicolas Fischer	
9:00-9:45	Invited talk: Numerical methods for solution of inverse and ill-posed problems Prof Loris Bellina
09:45-10:30	Invited talk: From Physics to Machine Learning and Back: Applications in Dynamical Systems Prof Olga Fink
10:30-11:00	Break
11:00-11:20	Modelling and inverse problems (RunAn) Chair Séverine Demeyer
11:20-11:40	Measurement uncertainty II (Scaniaalen) Chair Leslie Pendrill
11:40-12:00	Modelling of multiphase flow measurements in Coriolis flowmeters: Status, cross-disciplinary applications and future developments Viki Buzs
12:00-12:20	Combination and propagation of measurement uncertainty in the presence of serial correlation Adrián M.H. Van Der Veen
12:20-12:40	Development of a computational fluid dynamics-based surrogate model for the improved flow prediction in non-ideal sonic nozzles Sébastien Weiss
12:40-1:00	Evaluating Uncertainty Propagation in Mass- and Volume-Based Methods for Custody Transfer of Hydrogen Kjell Folger
1:00-1:20	Towards traceable metrology for optical constants and nanostructures: Results from an EMPIR project Sébastien Heidenreich
1:20-1:40	Using triangulation method to address regression problems for measurements of ultra-high electrical resistance Julian Mihai
1:40-2:00	Chemometric metrology: Propagating uncertainties through spectroscopic analysis methods Jack Clarke
2:00-2:20	Using deep learning for efficient and independent sampling in high-dimensional linear Bayesian inference problems Manuel Marschall
2:20-2:40	Lunch and Poster Session (Volvofoajén)
2:40-3:00	See posters below
3:00-3:20	Conformity assessment (RunAn) Chair Ignacio Lina
3:20-3:40	Trustworthy machine learning (Scaniaalen) Chair Raghe Emdadon
3:40-4:00	A Bayesian model for measurements by counting and its application to conformity assessment Francesco Romano Pennacchi
4:00-4:20	Efficient ML-Assisted Uncertainty Quantification for Learned Groundwater Contaminant Diffusion Sorption Processes Stefano Scheuer
4:20-4:40	Proficiency testing of ordinal classifiers using MSA logistic regression Leslie Pendrill
4:40-5:00	Analytical result for uncertainty propagation through a trained multilayer perceptron regression model Camillo Sietre
5:00-5:20	Assessment of risks of false decisions in analytical chemistry (testing) laboratories A framework for evaluating uncertainty calibration in deep learning: a case study in photoplethysmography signal analysis Coran Benchi
5:20-5:40	Break
5:40-6:00	Statistical methods for Intercomparison (Scaniaalen) Chair Katy Klausberg
6:00-6:20	Interlaboratory comparisons for ensemble data Sébastien J. Petit
6:20-6:40	Bridging classical and Bayesian hypothesis testing for more reliable estimation of degrees of equivalence in key comparisons Séverine Demeyer
6:40-7:00	Meeting of EMN Mathmet members (Scaniaalen)
7:00-7:30	Gala Dinner (Chalmerska huset)

Posters

Application of Digital-Metrological Twin for emerging measurement technology in advanced manufacturing, Steen Bergstrand

Direct Estimation of Coverage Factor from Raw Data: A Bootstrap-Bayesian Comparison with Welch-Satterthwaite, Asaf Alalash

Estimating Calibration Drift Uncertainty Using Bootstrap Regression Analysis, Karan Simmalfoz

Metrology for smart metering in gas networks, Adrián M.H. Van Der Veen

Preparation of MathMet linked project GridData: "Metrology for Reliable Grid Data Analysis", Angela Espin-Olgedo

The BioAirMet Project on Standardisation of Biosensor Monitoring For Air Quality and Climate Modelling, Mansoor Nabawi

Indirect measurements of resistor and capacitor equivalent parameters of diagrams based on frequency response, Jacsó Puchalski

The SmartTwin project: The Dissolved Oxygen digital twin of the Smart Bay at Lerici, Italy, Gianfranco Durin

Extension of the Welch-Satterthwaite equation to correlated measurements, Ippó Zoltán

Uncentred Kalman Filtering for Identification of Utility Meter Offset and Service Pipe Insulation Levels in District Heating Networks, Peter Friis Østergaard

Imaging Outcomes, Alessandro Arduino

24DIT01 APULIO - Automated Pixel-wise Uncertainty Levels up Automated, Adaptive and Uncertainty-Aware Smart Measurements using Machine Learning, Manuel Marschall

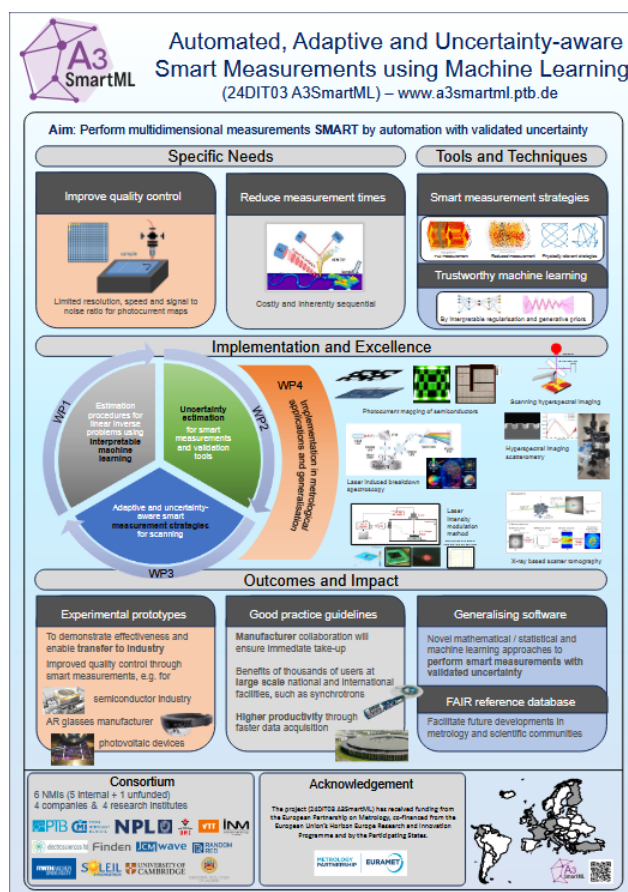
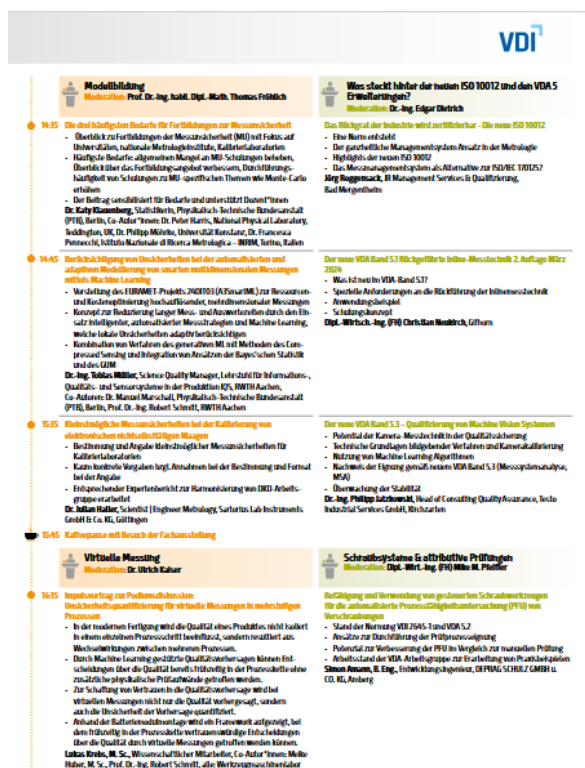


Figure 8: Left: Excerpt of the Program of the Mathmet 2025 conference; Right: Poster that was presented at the Mathmet 2025 conference.

12. VDI-Fachtagung Messunsicherheit und Prüfprozesse 2025, Erfurt, Germany

Müller, T., Marschall, M., Huber, M., Kästner, B., Schmitt, R. (2025, November): Berücksichtigung von Unsicherheiten bei der automatisierten und adaptiven Modellierung von smarten multidimensionalen Messungen mittels Machine Learning [Conference Presentation]. 12. VDI Fachtagung Messunsicherheit und Prüfprozesse 2025, Erfurt, Germany.

On 5th and 6th of November 2025, the “12. VDI Fachtagung Messunsicherheit und Prüfprozesse 2025” (12th VDI Symposium on measurement uncertainty and inspection processes), organised by the VDI/VDE Society for Measurement and Automation Technology, took place in Erfurt, Germany. The conference brings together scientists and industrial users of measurement technology and provides a framework for interdisciplinary exchange. Tobias Müller (RWTH) has given an oral presentation about the project at the conference. In addition, a manuscript was prepared for the conference proceedings.



Modellbildung
Moderation: Prof. Dr.-Ing. habil. Dipl.-Math. Thomas Fritsch

10:35 Die drei häufigsten Bedarfe für Fortbildungen zur Messunsicherheit

- Bedarfe zu Fortbildungen der Messunsicherheit (MU) sind fast auf allen Stufen, von der Messtechnik bis zur Kalibrierung, vorhanden.
- Häufigste Bedarfe: allgemeine Mängel an MU-Schulungen beheben, Überblick über die Fortbildungsmöglichkeiten, Durchführungsbedingungen von Schulungen zu MU, spezifische Themen wie Monte Carlo Verfahren.
- Der Beitrag verdeutlicht für Bedarfe und unterteilt diese in Themen.

Dr. Taty Klemberg, Statistik-Berater, Physikalisch-Technische Bundesanstalt (PTB), Berlin, Co-Autor: Dr. Peter Hertz, National Physical Laboratory, Teddington, UK, Dr. Philipp Möhrke, Universität Konstanz, Dr. Francesca Pavesio, Istituto Nazionale di Ricerca Metrologica – INRIM, Torino, Italien

10:45 Berücksichtigung von Unsicherheiten bei der automatisierten und adaptiven Modellierung von smarten multidimensionalen Messungen mittels Machine Learning

- Vorstellung des (VIM) 1.0, Praktisch: (VIM) 1.0 (VIM) 1.0 zur Messunsicherheit und Kundenorientierung hochdimensionaler, multidimensionaler Messungen.
- Konzept zur Reduzierung langer Mess- und Anzeigenzeiten durch den Einsatz intelligenter, adaptiver Messungen und Machine Learning, welche lokale Unsicherheiten adaptiv berücksichtigen.
- Kombination von Verfahren des generativen ML mit Methoden des Ensemble-Learning und Integration von Resultaten des Bayesianen Schätzens und des GEM.

Dr.-Ing. Tobias Müller, Senior Quality Manager, Lehrstuhl für Informations-, Qualitäts- und Sensordaten in der Produktion IQS, RWTH Aachen, Co-Autor: Dr. Marcel Marschall, Physikalisch-Technische Bundesanstalt (PTB), Berlin, Prof. Dr.-Ing. Robert Schmitt, RWTH Aachen

10:55 Elektronisch gesteuerte Messunsicherheit bei der Kalibrierung von elektronischen Messungsmitteln

- Bestimmung und Angabe Messunsicherheiten für Kalibrierlaboratorien.
- Keine verbindliche Vorgaben bzgl. Ansatzes bei der Bestimmung und Format bei der Angabe.
- Integrierender Expertenbericht zur Harmonisierung von DIN Arbeitsgruppenarbeit.

Dr. Ingrid Hübner, Sachverständigenbüro Messtechnik, Sartorius Lab Instruments GmbH & Co. KG, Göttingen

10:45 Kaffeepause mit Besuch der Fachausstellung

Virtuelle Messung
Moderation: Dr. Ulrich Kahr

10:55 Implementierung zur Prozessoptimierung für virtuelle Messungen in industriellen Prozessen

- In der modernen Fertigung wird die Qualität eines Produkts nicht isoliert in einem einzelnen Prozessschritt bewertet, sondern resultiert aus Wechselwirkungen zwischen mehreren Prozessen.
- Durch Machine Learning gestützte Qualitätsüberwachung können Inspektionen über die Qualität bereits frühzeitig in der Produktion oder vor der physischen Produktion getroffen werden.
- Zur Schaffung von Vertrauen in die Qualitätsüberwachung wird Verfahren Messungen nicht nur die Qualität vorhergesagt, sondern auch die Unsicherheit der Vorhersage quantifiziert.
- Aufbau der Rollenmodellierung wird ein Framework aufgestellt, bei dem frühzeitig in der Prozesskette vertrauenswürdige Entscheidungen über die Qualität durch virtuelle Messungen getroffen werden können.

Leiter: Dr. M. Sc. Wissenschaftlicher Mitarbeiter, Co-Autor: Tobias Müller, Huber, M. Sc., Prof. Dr.-Ing. Robert Schmitt, alle Werkzeugmaschinenlabor

Was steckt hinter der neuen ISO 10012 und den VDA 5 Erweiterungen?
Moderation: Dr.-Ing. Edgar Dietrich

Der Rückgrat der Industrie wird zur Verfügung - Die neue ISO 10012

- Eine kurze Einführung.
- Der geschäftliche Management-Ansatz in der Messtechnik.
- Highlights der neuen ISO 10012.
- Das Messmanagement als Schlüssel zur ISO/IEC 17025:2017.

Dr. Rüdiger, IT Management Services & Qualifizierung, Bad Mergentheim

Der neue VDA Band 5.1 Rückgrat der Industrie - Messtechnik 2. Auflage März 2024

- Was ist neu im VDA Band 5.1?
- Spezifische Anforderungen an die Risikoprüfung der Lieferanten.
- Anwendungsbeispiel.
- Schlussfolgerung.

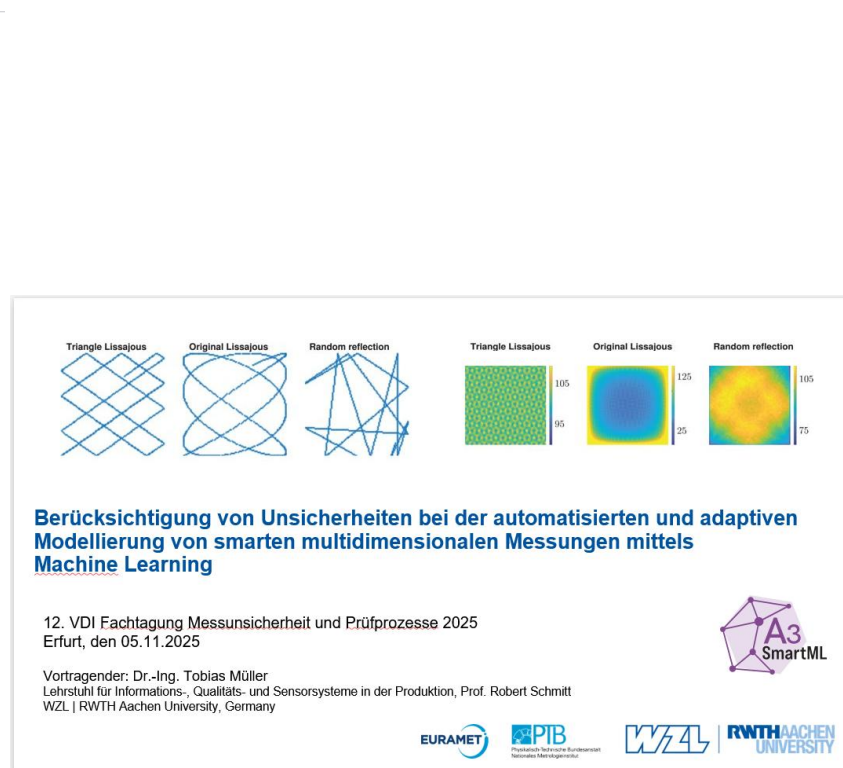
Dipl.-Ing. Dr. Christian Wiedrich, Göttingen

Schreibsysteme & effiziente Prüfungen
Moderation: Dipl.-Ing. Dr. M. Pfister

Beitrag und Umsetzung von geschulten Schreibsystemen für die automatisierte Prozessfähigkeitsüberwachung (PFU) von Versuchsbedingungen

- Stand der Normung VDA 5.1 und VDA 5.2.
- Ansatz zur Darstellung der Prozessüberwachung.
- Potenzial zur Verbesserung der PFU im Vergleich zur manuellen Prüfung.
- Arbeitszustand der VDA-Anforderungen zur Erstellung von Prüfungsprotokollen.

Simon Amann, B. Eng., Inbetriebnahmeingenieur, DEPRAG SCHULZ GMBH & CO. KG, Aberg



Berücksichtigung von Unsicherheiten bei der automatisierten und adaptiven Modellierung von smarten multidimensionalen Messungen mittels Machine Learning

12. VDI Fachtagung Messunsicherheit und Prüfprozesse 2025
Erfurt, den 05.11.2025

Vortragender: Dr.-Ing. Tobias Müller
Lehrstuhl für Informations-, Qualitäts- und Sensordaten in der Produktion, Prof. Robert Schmitt
WZL | RWTH Aachen University, Germany

A3 SmartML

EURAMET PTB WZL RWTH AACHEN UNIVERSITY

Figure 9: Left: Excerpt of the Program of the conference; Right: Title page of the oral presentation that was given at the conference.

Outlook: Upcoming Events

M18 Project and Stakeholder Meeting organised by VTT

The M18 Project Meeting will be organized by VTT. Part of the M18 meeting will be the first meeting of the Stakeholder Committee. We kindly invite all stakeholders of the project to join the M18 meeting either on-site or remote. Further information will be shared when the date approaches.

Some facts:

Project start date and duration:		May 2025, 36 months	
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